

## CLAIMS

1 1. A lens array comprising an array of lens elements having a backplane for reproducing  
2 an image located at the backplane, each lens having a nonunitary magnification and  
3 reproducing visual information from the backplane to a finite conjugate region in free  
4 space such that the reproduced visual information overlaps with visual information  
5 reproduced in free space by at least one neighboring lens element.

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7 2. The lens array of claim 1 wherein the visual information is reproduced by the lens  
8 elements as a stereoscopic image.

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10 3. The lens array of claim 1 further comprising a source of visual information on the  
11 backplane, the visual information comprising pixels each constituting a discrete  
12 component of visual information, each lens element producing an aerial image  
13 comprising multiple pixels simultaneously viewable at the conjugate region.  
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16 4. The lens array of claim 1 wherein the visual information produced in free space varies  
17 with a viewing angle, the lens elements having lens pitch defining center-to-center  
18 distances therebetween and cooperating to reproduce an image having a spatial  
19 resolution distinct from the lens pitch.  
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1 5. The lens array of claim 4 wherein the lens elements cooperate to reproduce an image  
2 having a spatial resolution greater than the lens pitch.

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1 6. The lens array of claim 1 wherein the lens elements have magnifications ranging from  
2 1:8 to 1:100.

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1 7. The lens array of claim 1 wherein the lens elements cooperate to project a finite  
2 conjugate field to a series of curved quadratic surfaces in free space.

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1 8. The lens array of claim 7 wherein quadratic surfaces produced by each of the lens  
2 elements intersect, forming a mosaic virtual field having locally varying spatial and  
3 angular resolutions.

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1 9. The lens array of claim 8 wherein the lens elements have a residual field curvature so  
2 as to vary locally in magnification, the mosaic virtual field and varied magnification  
3 facilitating visual decorrelation of images individually produced by the lens elements.

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1 10. The lens array of claim 1 wherein the lens elements have a residual field curvature  
2 so as to vary locally in magnification, the lenses providing an angular resolution  
3 increasing toward a center of a viewing field and a spatial resolution at increasing at  
4 peripheral angular locations.

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1 11. The lens array of claim 10 wherein a degree of visual-information overlap  
2 determines a rate at which spatial resolution decreases with distance from the center of  
3 the viewing field.

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1 12. A method of producing an aerial image in free space, the image having a spatial  
2 resolution and varying with viewing angle according to an angular resolution, the  
3 method comprising the steps of:

4 a. providing a lens array comprising an array of lens elements having a  
5 backplane and a nonunitary magnification, the lens array reproducing visual  
6 information to a finite conjugate region in free space, the spatial and angular  
7 resolutions of the image varying with the magnifications of the lens elements,  
8 visual information reproduced at the finite conjugate region by each lens  
9 element overlapping with visual information reproduced at the finite conjugate  
10 region by at least one neighboring lens element; and

11 b. selecting a magnification corresponding to a predetermined angular and  
12 spatial image resolution.

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1 13. The method of claim 12 further comprising the step of varying a distance between  
2 the visual information and the backplane to vary the magnification.

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1 14. The method of claim 12 wherein the visual information is reproduced by the lens  
2 elements as a stereoscopic image.

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1 15. The method of claim 12 further comprising the step of providing a source of visual  
2 information on the backplane, the visual information comprising pixels each constituting  
3 a discrete component of visual information, each lens element producing an aerial  
4 image comprising multiple pixels simultaneously viewable at the conjugate region.

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1 16. The method of claim 12 wherein the visual information produced in free space  
2 varies with a viewing angle, the lens elements having lens pitch defining center-to-  
3 center distances therebetween, the magnification causing reproduction of visual  
4 information at a spatial resolution distinct from the lens pitch.

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1 17. The method of claim 16 wherein the spatial resolution is greater than the lens pitch.

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1 18. The method of claim 16 wherein the selected magnification ranges from 1:8 to  
2 1:100.

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1 19. The method of claim 12 wherein the lens elements cooperate to project a finite  
2 conjugate field to a series of curved quadratic surfaces in free space.

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1 20. The method of claim 19 wherein quadratic surfaces produced by each of the lens  
2 elements intersect, forming a mosaic virtual field having locally varying spatial and  
3 angular resolutions.

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1 21. The method of claim 20 wherein the lens elements have a residual field curvature so  
2 as to vary locally in magnification, the mosaic virtual field and varied magnification  
3 facilitating visual decorrelation of images individually produced by the lens elements.  
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1 22. The method of claim 12 wherein the lens elements have a residual field curvature so  
2 as to vary locally in magnification, the lenses providing an angular resolution increasing  
3 toward a center of a viewing field and a spatial resolution at increasing at peripheral  
4 angular locations.

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